

Amendments to the Drawings:

The Applicant has attached a replacement sheet for Figures 6 and 7. Reference number 640 has been amended in response to the Examiner's drawing objection for clarity. It no longer includes reference to the layer with the die. Reference number 740 in Figure 7 has similarly been amended for clarity. Accordingly, Applicant submits that Figures 6 and 8 no longer delineate conflicting areas for 620 and 640. Reconsideration and withdrawal of the objection to the drawings is respectfully requested.

Attachment: Replacement Sheet

REMARKS/ARGUMENTS

The Applicant appreciates the Examiner's thorough examination of the subject application.

Claims 163-208 are pending in the subject application. Claims 163-208 were rejected in the Office Action mailed June 16, 2009 ("Office Action"), as described in further detail below.

Claims 163, 168, 176, 179, 184, 190-193, 196, 197 and 206 are currently amended. Figures 6 and 7 are amended herein in response to the Examiner's drawing objection and for clarity. No new matter has been added. In light of the foregoing amendments and the following remarks, the Applicant requests reconsideration and further examination of the subject application.

Drawing Objection

Figures 6 and 8 are objected to because Figures 6 and 8 allegedly delineate conflicting areas for 620 and 640. The Applicant has revised the drawings to overcome this objection. Specifically, the Applicant has amended Figure 6 for clarity. The Applicant has similarly amended Figure 7. Accordingly, Applicant submits that Figures 6 and 8 no longer delineate conflicting areas for 620 and 640. Reconsideration and withdrawal of the objection to the drawings is respectfully requested.

Claim Rejections – 35 USC § 112

The Examiner removed the rejections under 35 USC § 112, first paragraph, of the December 10, 2008 Office Action. The Examiner also rejected claims 163-208 under 35 USC § 112, second paragraph as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention.

The Applicant appreciates the Examiner's removal of the rejections under 35 USC § 112, first paragraph, in the Office Action. The Applicant further states that the term "insulating layer" includes, but is not limited to, layers comprising polyimide, benzocyclobutene, and epoxy, as known in the art and described in paragraphs 30, 31, and 53.

Claims 163-208 are rejected under 35 USC § 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the Applicant regards as the invention. Specifically, the Examiner rejected Claim 163 and the other claims depending therefrom, by alleging that "a portion" is indefinite. Amended claims 163 recites "a

passive device over said second insulating layer, wherein said passive device comprises a passive device portion directly over said top surface of said first portion of said first insulating layer.”

According to www.dictionary.com, a “portion” means “a part of any whole, either separated from or integrated with it.” This term is not indefinite, but concisely provides that a part of the passive device, a “passive device portion” is over the second insulating layer. For this reason, the Applicant respectfully requests reconsideration and withdrawal of this rejection of claim 163 and its dependent claims 164-178.

The Examiner has not identified the grounds for rejecting claims 179-208 under 35 USC § 112, second paragraph. In view of the amendments and remarks set forth above, the Applicant respectfully requests that the Examiner reconsider and withdraw this rejection of claims 179-208. Accordingly, the Applicant submits that claims 163-208 are in condition for allowance.

Claim Rejections – 35 USC § 103

Claims 163-208 are rejected under 35 USC § 103(a), as being unpatentable over U.S. Patent No. 6,396,148 to Eichelberger et al. (“Eichelberger”) with U.S. Patent No. 5,196,377 to Wagner et al. (“Wagner”) and U.S. Patent No. 6,707,124 to Wachtler et al. (“Wachtler”).

Claims 163-208 are also rejected under 35 USC § 103(a) as being unpatentable over Eichelberger with Wagner and Wachtler and U.S. Patent No. 5,745,984 to Cole Jr. et al. (“Cole”).¹

Claims 163-208 are also rejected under 35 USC § 103(a) as being unpatentable over Eichelberger with Wagner and Wachtler and further in view of U.S. Patent No. 4,866,501 to Shanefield (“Shanefield”) and U.S. Patent No. 5, 541,442 to Keil et al. (“Keil”).

Claims 163-208 are also rejected under 35 USC § 103(a) as being unpatentable over Eichelberger with Wagner and Wachtler, Shanefield and Keil, and further in view of Cole.

Reconsideration and withdrawal of the claim rejections are respectfully requested in light of the amendments and remarks set forth herein.

One requirement for a rejection under 35 U.S.C. § 103(a) is that the cited reference(s) must teach or suggest all of the limitations of the claim(s) at issue. Another requirement

¹ While the Examiner asserts that “Cole” is of record and since two patents to Cole, Jr. et al. have been cited in the prosecution of the subject application, the Applicant presumes the Examiner is identifying the reference cited in the more recent January 4, 2008 Office Action (U.S. Patent No. 5,745,984), not the reference cited in the October 6, 2005 Office Action.

necessary for a rejection under 35 U.S.C. § 103(a) is that proper motivation must exist to modify the teachings of the cited reference(s) in the way proposed by the Examiner for the rejection. These requirements are not met in this situation, as will be explained.

Obviousness Rejection Over Eichelberger with Wagner and Wachtler

Claims 163-208 are rejected under 35 USC § 103(a) as being unpatentable over Eichelberger with Wagner and Wachtler, of record. The Examiner states that the previous rejection still applies and that the “passive device” limitations are not considered to distinguish over the applied art because “there are no material distinctions between “passive devices” in the claims and the inherent capacitance, resistance, and inductance of overlying metal lines disposed directly over the chips in the applied art.” Although stating “the previous rejection still applies” is unclear, the Applicant nevertheless traverses these rejections.

In Figure 2 of Eichelberger, the metallization structure 108 and 114 creates resistance, capacitance, and inductance; however, Eichelberger fails to teach or suggest that the resistance, capacitance and inductance of metallization structure 108 can be used to create a resistor, capacitor or inductor. Eichelberger further teaches a metallization structure connecting two pads on different dies, as shown in Figure 2, teaching away from connecting two pads on the same die using a metallization structure. *See* Eichelberger Figures 3F-G, col. 8, ll. 17-36.

Wagner teaches laying buried traces in silicon to interconnect integrated circuits. Similarly, Wagner teaches layering multiple buried traces on top of each other to interconnect various integrated circuit dies.

Wachtler teaches layering thin films with interconnects to provide direct electrical connection from a semiconductor device sitting in a cavity in a substrate to solder balls above the metallization layers.

These references do not teach or suggest, individually or in combination the features of Claim 163, specifically with respect to “passive device over said second insulating layer, wherein said passive device comprises a passive device portion directly over said top surface of said first portion of said first insulating layer.” None of Eichelberger, Wagner, Wachtler, or combinations thereof teach or suggest forming of the claimed designed passive device of Claim 163. While some features of Eichelberger, Wagner, and Wachtler may possess inherent resistance, capacitance, and/or inductance characteristics, the passive device of Claim 163 is not seen to be

disclosed or taught by those references. Thus the Applicant respectfully submits that Claims 163-178 are in condition for allowance.

Claim 179 similarly recites “a passive device over said second insulating layer.” For the same reasons as for Claim 163, the Applicant submits that Claims 179-196 are in condition for allowance.

Applicant further submits that there is not seen to be motivation to combine the three references in the way proposed by the Examiner. Claim 179 recites:

a die between a first portion of said first insulating layer and a second portion of said first insulating layer, wherein said die has a top surface substantially coplanar with a top surface of said first portion of said first insulating layer and with a top surface of said second portion of said first insulating layer;

and

a patterned metal layer over said second insulating layer, over said top surface of said die and over said top surfaces of said first and second portions of said first insulating layer, wherein said patterned metal layer comprises electroplated copper, wherein said patterned metal layer is connected to a first metal pad of said die through a first opening in said second insulating layer, and to a second metal pad of said die through a second opening in said second insulating layer, **wherein said first metal pad is connected to said second metal pad through said patterned metal layer.**

[emphasis added].

While Eichelberger discloses a die on top of, instead of inside, a substrate, Eichelberger teaches away from interconnecting two pads of the same die through a patterned metal layer. Although Wachtler discloses connecting bonding pads of the same die through metallization planes (Figure 14; col. 9, ll. 35-45), it only discloses dies placed within a cavity of a substrate, not placed on the substrate. One skilled in the art would not have been motivated to combine the two references due to these conflicting teachings. Because Wagner does not teach or disclose these claim limitations, the Applicant submits that a motivation to combine the references in the manner proposed by the Examiner does not exist. Thus, the Applicant submits that Claims 179-196 are in condition for allowance.

Claim 197 recites similar limitations:

a die between a first portion of said first insulating layer and a second portion of said first insulating layer, wherein said die has a top surface substantially coplanar with a top surface of said first portion of said first

insulating layer and with a top surface of said second portion of said first insulating layer;

and

a patterned metal layer over said second insulating layer, over said top surface of said die and over said top surfaces of said first and second portions of said first insulating layer, wherein said patterned metal layer comprises electroplated copper, wherein said patterned metal layer comprises a ground piece connected to a first metal pad of said die through a first opening in said second insulating layer, and to a second metal pad of said die through a second opening in said second insulating layer, **wherein said first metal pad is connected to said second metal pad through said ground piece.**

For the same reasons as stated above, Applicant submits that the motivation to combine the three references in the way proposed by the Examiner is not seen to exist. Thus, the Applicant respectfully submits that claims 197-208 are in condition for allowance.

Accordingly, the Applicant respectfully requests that the Examiner withdraw these rejections of claim 163, 179, and 197. The Applicant also further requests withdrawal of these rejections of claims 164-178, 180-196, and 198-208 because of their dependence on claims 163, 179, and 197, respectively.

Obviousness Rejection Over Eichelberger with Wagner and Wachtler and Cole

Claims 163-208 are rejected under 35 USC § 103(a) as being unpatentable over Eichelberger with Wagner and Wachtler and Cole. The Examiner's basis for this rejection is stated as "the previous rejection still applies." In the previous rejection of December 10, 2008, the Examiner's basis is also "the previous rejection applies." In the next previous rejection of June 17, 2008, the Examiner's basis is also "the previous rejection applies." In the next previous rejection of January 4, 2008, the Examiner asserted that Cole suggests BCB for its superior properties as an adhesive and in multilayer metallization schemes as Eichelberger.

Cole is seen to teach "an improved dielectric adhesive material and, more particularly, [] the use of benzocyclobutene polymer as a laminate adhesive in the construction of the high density interconnect structure of a multi-chip module." Cole col. 1, ll. 4-8. The teachings of Cole, however, do not remedy the aforementioned deficiencies identified above with Eichelberger, Wagner, and Wachtler, in comparison to Applicant's independent claims 163, 179

and 197. Accordingly, the Applicant respectfully requests that the Examiner withdraw these rejections of claims 163-178, 179-196, and 197-208.

Obviousness Rejection Over Eichelberger with Wagner and Wachtler and further in view of Shanefield and Keil

Claims 163-208 are rejected under 35 USC § 103(A) as being unpatentable over Eichelberger with Wagner and Wachtler and further in view of Shanefield and Keil. In the present Office Action, the Examiner asserts that Shanefield discloses a circuit element 25 disposed over a chip in an arrangement similar to Eichelberger with multilevel wirings. The Examiner further asserts that Keil discloses that circuit elements are resistors, capacitors, or inductors and discloses circuit elements of passive devices disposed over a chip in a multilevel metallization scheme. Thus, the Examiner states, it would have been a *prima facie* obvious step to integrate passive elements of inductors, resistors or capacitors directly over chips and connected to multilevel metallizations, likewise located directly over chips. The Applicant respectfully disagrees.

Shanefield is seen to teach a conductive layer 18, 19 or 25 that extends across an edge of a die 11 and over a semiconductor wafer 10, and Applicant submits that such conductive layer shown in Shanefield is not equivalent to a first insulating layer. Shanefield discloses cavities in a substrate 10 containing integrated circuit chips 11. Interconnections 23 are made via tape automated bonding (“TAB bonding”) and TAB bonding contacts. Shanefield col. 2, ll. 45-63; col. 3, ll. 16-30. The unspecified and undefined circuit elements 25 reside on top of, not within, the semiconductor package.

Keil is seen to disclose forming a capacitor, resistor, and/or inductor configuration using a CMOS FET design. The mere use of the word “circuit element” in Keil and Shanefield does not create a motivation to combine the two references in the manner proposed by the Examiner. Using that phrase in Keil does not necessitate that its meaning is the same as the one assigned to “circuit element” in Shanefield. This sort of hindsight analysis is improper and does not create a motivation to combine the references to demonstrate universality of meaning. Thus, the Applicant respectfully requests the Examiner to withdraw this rejection of claims 163-208.

Moreover, even if such a motivation to combine existed, the neither Shanefield nor Keil, whether individually or in combination, disclose forming “a passive device over said second

insulating layer.” In this regard, Shanefield is not seen to have an insulating layer surrounding Shanefield’s die 11, but instead only shows wafer 10 having two portions at opposite sides of die 11. Accordingly, the Applicant respectfully requests that the Examiner withdraw these rejections of claims 163-178. Because claim 179 and 197 recite “a passive device over said second insulating layer,” the Applicant further requests that the Examiner withdraw these rejections of claims 179-196, and 197-208.

Obviousness Rejection Over Eichelberger with Wagner and Wachtler, Shanefield and Keil, and further in view of Cole

Claims 163-208 are rejected under 35 USC § 103(a) as being unpatentable over Eichelberger with Wagner and Wachtler, Shanefeld and Keil, and further in view of Cole. The Examiner asserts that, “[a]s in the previous rejection, Cole suggests BCB material for its superior properties as an adhesive and in multilayer metallization schemes as Eichelberger.”

For the reasons stated above, these references, whether individually or in combination, either do not teach or suggest the limitations of claims 163, 179, and 197 or would not be combined by one skilled in the art in the manner the Examiner proposes. Accordingly, the Applicant respectfully requests that the Examiner withdraw these rejections to claims 163-208.

Claims 163, 168, 179, and 197 and Arguments Regarding Electroplated Copper

The Examiner asserts that arguments regarding electroplated copper having properties not shown by the applied art are unconvincing of patentability because the alleged properties are not specifically claimed and therefore the claims do not distinguish over the applied art. The Applicant respectfully disagrees.

The Applicant submits that the claimed electroplated copper in claims 163, 168, 179, and 197 has a specific micro-structure that can be identified in a final product using a TEM cross-section or by the composition analysis using Energy-Dispersive X-ray (EDX) spectroscopy or X-ray fluorescence. The claimed electroplated copper has distinctive structural characteristics and imparts these characteristics onto the final product. None of the applied references are seen to disclose, alone or in combination, the combination of features set forth in Claims 163, 168, 179 and 197 that includes a patterned metal layer comprising electroplated copper. Accordingly, Applicant requests withdrawal of the rejections based on such arguments.

CONCLUSION

In light of the Amendments and Remarks herein, Applicants submit that all claims are in condition for allowance and respectfully request a notice to this effect. Should the Examiner have any questions, please call the undersigned at the phone number listed below.

Attached is a Petition for a Two-Month Extension of Time under 37 C.F.R. § 1.136. The Commissioner is hereby authorized to charge \$490 to Deposit Account 502624. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 502624 and please credit any excess fees to such deposit account.

Respectfully submitted,
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